(which is the largest model available) was still too small for the patient. In all 7 patients, paravalvular leak grade I or greater was found.

CONCLUSIONS

In 10 of 15 patients with postoperative AI or AVB, the new system would have promoted a different valve selection. These observations suggest that the template-based planning approach is a viable aid in preoperative assessment of the atrioventricular geometry and valve selection. To substantiate the reported findings, larger studies are necessary.

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Anterior arch translocation for coarctation of circumflex aorta using median sternotomy without cardiopulmonary bypass

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The operative approach to the management of coarctation in the presence of hypoplastic circumflex, retroesophageal aorta is not well defined.[1-3] We present the case of 4-year-old boy who had coarctation with hypoplastic retroesophageal arch. This was managed by translocation of hypoplastic retroesophageal arch anteriorly and creation of a left neoaortic arch through a median sternotomy without the use of cardiopulmonary bypass. We believe that median sternotomy is the approach of choice in the management of coarctation of the circumflex aorta.

CLINICAL SUMMARY

A 4-year-old boy weighing 14 kg had dyspnea on exertion and palpitations with increased precordial activity gradually worsening over the prior 2 years. On diagnostic workup, which included echocardiography, cardiac catheterization, and magnetic resonance angiography, he was found to have a circumflex aorta with coarctation and hypoplasia of the retroesophageal portion of the arch. The origin of the left subclavian artery (LSCA) was stenotic. The vessels of the ascending aorta were the left common carotid artery, the right common carotid artery, and the right subclavian artery. A coarctation was present at the base of right subclavian artery, with hypoplasia of the retroesophageal portion. A Kommerell diverticulum was present at the proximal portion of the descending aorta, which gave rise to a stenotic LSCA and a long narrow ductus. Although there was a complete vascular ring, the relatively long ductus probably did not cause any symptoms of tracheoesophageal compression (Figure 1).

We decided to approach the repair through a sternotomy. After median sternotomy and complete thymectomy, the ascending aorta, all 4 arch vessels, the patent ductus arteriosus, and the descending aorta were dissected. The descending aorta was extensively mobilized to the level of the first intercostals to achieve a tension-free anastomosis. The arch of the aorta to the right and left of the esophagus was looped as well. The patient was heparinized. The arch of the aorta at the base of right subclavian artery was transfixed and divided. The arch was mobilized from behind the esophagus. There were no vessels arising from this part of the aorta to the esophagus. The patent ductus was divided and the base of the stenotic LSCA was divided and transfixed as well. The arch was transclocated anteriorly after division of the LSCA and ductus. A side-biting clamp was applied to the ascending aorta at the base of left carotid artery. After spatulation of the arch, it was anastomosed to the side of

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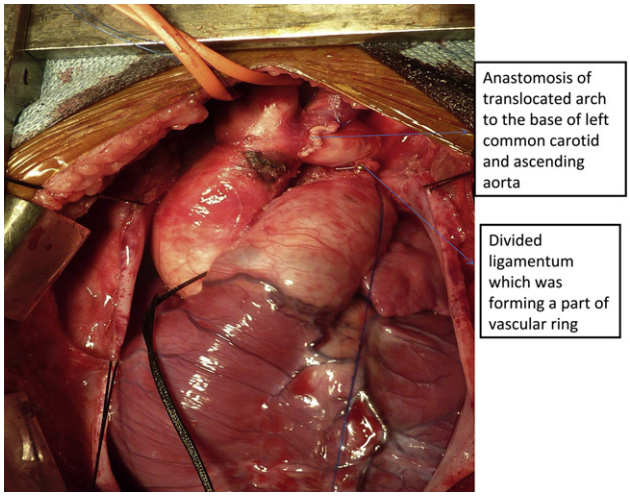

FIGURE 1. Circumflex aorta with coarctation and hypoplasia of retroesophageal arch and noncompressive vascular ring.

ascending aorta with 6–0 polypropylene. The base of the Kommerell diverticulum was clipped with a large Ligaclip ligating clip (Ethicon, Inc, Somerville, NJ), excluding the diverticulum (Figure 2). There was no gradient between the right radial artery and the femoral artery. The clamp time was 21 minutes. The patient was extubated on the second postoperative day and was discharged home on the seventh day with no residual gradient.

DISCUSSION

The main issue in the management of the patient was the approach to repair the coarctation and hypoplastic arch in a circumflex aorta. On literature review, 2 approaches have been described. One was mobilization and end-to-end anastomosis in an infant with ventricular septal defect on cardiopulmonary bypass.[1] The second approach was to use an extra-anatomic conduit between the ascending and descending aorta using a right thoracotomy approach.[2,3] Our patient differed from these cases in that we were not certain that he was young enough to permit extensive mobilization in the absence of any intracardiac anomaly that did not necessitate the use of cardiopulmonary bypass. We did not think that he was old enough to warrant an extracardiac conduit. We thought achieving native tissue–tissue anastomosis was preferable and we opted for a sternotomy approach, which would also permit easy institution of cardiopulmonary bypass if necessary.

Median sternotomy allowed extensive mobilization of the arch and arch vessels on either side of the esophagus. A noncompressive vascular ring, which was formed by

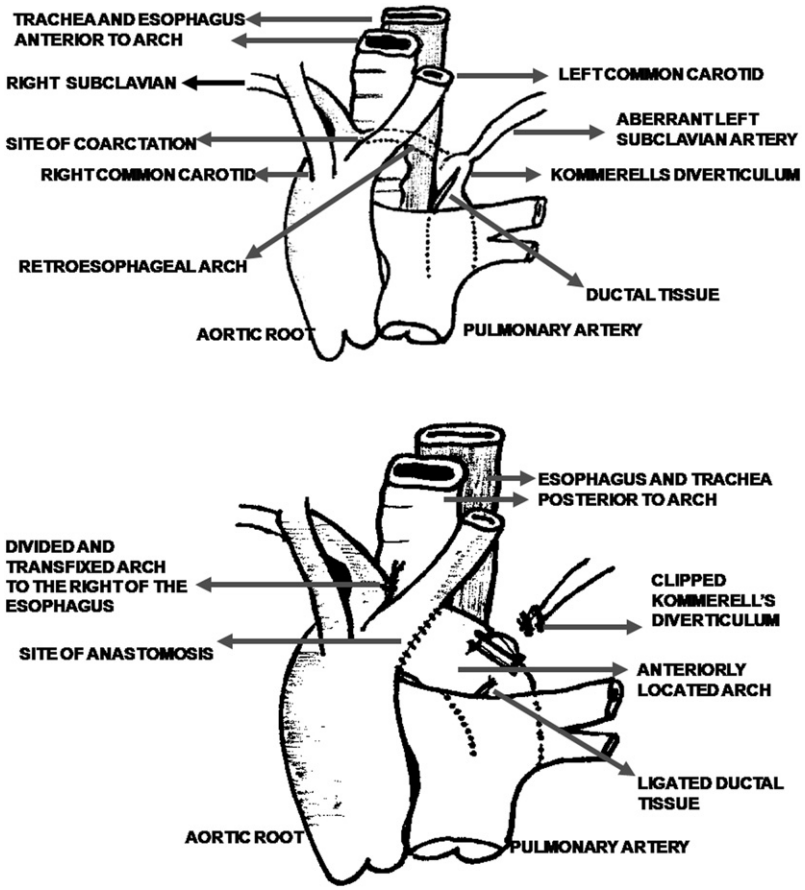

FIGURE 2. Arch translocated anteriorly after dividing the ductal tissue and stenotic left subclavian artery and clipping of Kommerell diverticulum.

the long and narrow patent ductus arteriosus, was diagnosed and dealt with. Dysphagia owing to right aortic arch with left ligamentum is known to present late, unlike double aortic arch, which usually presents early.[2,4] We were surprised by the relative ease with which the arch could be mobilized and translocated anteriorly from behind the esophagus. The LSCA, which was already stenosed, was sacrificed to achieve a tension-free anastomosis.

During the development of normal aortic arches, there is dissolution of the right sixth aortic arch and of the dorsal aorta distal to the right subclavian artery. The right aortic arch with mirror-image branching is almost always associated with an intracardiac defect. A large percentage of patients with right aortic arch and retroesophageal LSCA do not have intracardiac anomalies.[4] The pathologic anatomy in this patient could be explained by the dissolution of the left fourth aortic arch with the presence of a left dorsal aorta. The ''ductal theory'' of development of coarctation could explain the development of this condition in the absence of an intracardiac anomaly. The ductal tissue migration to the origin of the LSCA and the arch could possibly explain the stenotic origin of the LSCA and the hypoplastic arch. The Kommerell diverticulum is formed by the proximal portion of the left dorsal aorta, the presence of which is an indirect indicator of the presence of ligamentum on that side.

Kommerell diverticulum is known to cause residual tracheoesophageal obstruction in patients with vascular ring.[5] This could be because of the gradual enlargement of the diverticulum and also because of the tugging effect of the LSCA. It is also known to be prone to aneurysmal and degenerative atherosclerotic changes.[6] We excluded the diverticulum by using a large Ligaclip ligating clip at its base. The division of the subclavian artery would prevent a slinglike effect, which would predispose to tracheoesophageal compression.

In summary, we believe that median sternotomy is the best approach in the management of coarctation of the circumflex aorta. It permits extensive mobilization of the arch and arch vessels on either side of the esophagus. The mobilized arch can easily be translocated anteriorly to achieve native tissue–tissue anastomosis. It also allows management of vascular ring and Kommerell diverticulum. The presence of a vascular ring may be difficult to diagnose in the absence of symptoms, and it has the potential to cause late-onset symptoms of predominantly esophageal compression. This approach also permits correction of any additional intracardiac defect.

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Successful thoracoscopic surgery for intractable pneumothorax after pneumonectomy under local and epidural anesthesia

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Management of pneumothorax in patients with limited pulmonary function of the contralateral lung is complicated. Among these situations, pneumothorax after pneumonectomy is potentially lethal and its treatment poses a significant risk.[1] We report a case of intractable right pneumothorax after left pneumonectomy, successfully treated by video-assisted thoracic surgery (VATS) under local and epidural anesthesia.

CLINICAL SUMMARY

A 74-year-old male patient underwent left pneumonectomy and mediastinal lymph node dissection for squamous

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